

## A conspectus of the genus *Amaranthus* (Amaranthaceae) in Australia

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### Abstract

Palmer, J. A conspectus of the genus *Amaranthus* L. (Amaranthaceae) in Australia. *Nuytsia* 19(1): 107–128 (2009). A synopsis of the 26 *Amaranthus* species known to occur in Australia is presented. *Amaranthus centralis* J.Palmer & Mowatt and *A. induratus* C.A.Gardner ex J.Palmer & Mowatt are described as new; distribution maps and photographs of the type specimens are included for these new species. *Amaranthus undulatus* R.Br. is the earliest correct name for the taxon currently known as *A. pallidiflorus* F.Muell., and lectotypes are selected for *A. clementii* Domin, *A. leptostachyus* Benth., *A. macrocarpus* Benth. and *A. mitchellii* Benth. A key to all species in Australia is presented.

### Introduction

This paper is a precursor to the treatment of *Amaranthus* L. (Amaranthaceae) for the *Flora of Australia* series, presented in order to provide names for two new taxa, as well as typification and nomenclatural information required for ongoing revisionary work in the genus by other workers. This work is partly based on research initiated by the late Dr Andrew Kanis. Dr Kanis completed a very thorough literature search and resolved many nomenclatural problems before his untimely death, in addition to making extensive lists of specimens and type material held in both Australian and non-Australian herbaria. These lists and his other notes are retained at the Australian National Herbarium (CANB) and are the basis for the reference ‘A. Kanis *in adnot.*’ used in this paper.

The genus *Amaranthus* comprises up to 70 species worldwide, mostly in tropical and warm temperate regions. Many species are of economic importance as cultivated food crops or ornamentals, or as widespread weeds.

Brown (1810) was the first to describe indigenous *Amaranthus* taxa from Australia publishing four new species in his *Prodromus*. A further eight indigenous species were described by Mueller (1859), Bentham (1870), Domin (1921) and Black (1936). Since 1936, only one additional indigenous taxon has been noted, the informal *Amaranthus* sp. A from the Kimberley region of Western Australia (Wheeler 1992). This taxon is formally published here as *Amaranthus induratus* C.A.Gardner ex J.Palmer & Mowatt. The present treatment recognises 26 species of *Amaranthus* in Australia, comprising 11 indigenous, 14 naturalised and one introduced species.

## Materials and methods

This study is based on the examination of herbarium specimens (reconstituted where necessary) held at AD, BM, BRI, CANB, DNA, HO, K, MEL, NSW, PERTH, PR and the private collection of the late A.C. Beaglehole, now incorporated in MEL. The fruit length measurements given here do not include the style and stigmas. Species names are arranged in alphabetical order.

### Key to the species of *Amaranthus* in Australia

1. Inflorescences all or mainly axillary clusters, rarely also forming a very small leafless terminal spike or panicle
  2. Bracts and bracteoles 2.5–4 mm long, shortly aristate, pungent ..... 1. *\*A. albus*
  - 2: Bracts and bracteoles 1–3 mm long, mucronate to shortly aristate but not pungent
  3. Fruit a circumscissile capsule
    4. Tepals 3 in female flowers, ovate or narrowly ovate ..... 11. *\*A. graecizans*
    - 4: Tepals 5 in female flowers, narrowly obovate to spatulate ..... 25. *A. undulatus*
  - 3: Fruit an indehiscent utricle
    5. Fruit smooth to rugose, with prominent (rarely weak), longitudinal, straight ribs or inflated undulate ribs
      6. Midnerve of tepals at the fruiting stage broad, 0.3–1 mm wide for some or all of length
        7. Fruit 1.2–1.5 mm long, obovoid to globose; ribs inflated and undulate ..... 17. *A. mitchellii*
        - 7: Fruit 1.5–3 mm long, ellipsoid; ribs slightly raised, straight
          8. Leaves linear to narrowly oblong or narrowly ovate; margins of tepals at the fruiting stage with a single or serrated tooth-like projection on each side ..... 14. *A. induratus*
          - 8: Leaves ovate or elliptic; margins of tepals at the fruiting stage without tooth-like projections ..... 4. *A. centralis*
      - 6: Midnerve of tepals at the fruiting stage narrow, c. 0.1 mm wide for entire length ..... 15. *A. interruptus*
    - 5: Fruit rugulose to rugose, without prominent, longitudinal, straight ribs or inflated undulate ribs
      9. Fruit 3–5 mm long (rarely only 2 mm long), ellipsoid
        10. Tepals 5, 4–8 mm long; fruit slightly shorter than tepals ..... 12. *A. grandiflorus*
        - 10: Tepals 3 (rarely 4 or 5), to 3 mm long; fruit longer than tepal
          11. Fruit black or dark brown ..... 16a. *A. macrocarpus* var. *macrocarpus*
          - 11: Fruit pallid or straw-coloured ..... 16b. *A. macrocarpus* var. *pallidus*
      - 9: Fruit 1–2.5 mm long, globose or obovoid
        12. Tepals at the fruiting stage 1.2–1.6 mm long (rarely to 2.3 mm long), spatulate; fruit usually equal to or longer than tepals ..... 6. *A. cochleitepalus*
        - 12: Tepals at the fruiting stage 1.5–3 mm long, broadly spatulate, obovate-spatulate, rounded-obtrullate-spatulate, narrowly obovate-spatulate or narrowly obovate; fruit equal to or shorter than tepals
          13. Tepals at the fruiting stage broadly spatulate, obovate-spatulate or rounded-obtrullate-spatulate, spreading to recurved ..... 8. *A. cuspidifolius*
          - 13: Tepals at the fruiting stage narrowly obovate-spatulate or narrowly obovate, usually erect ..... 15. *A. interruptus*

- 1: Inflorescences mainly terminal, leafless, elongated spikes or panicles, although smaller spikes or axillary clusters may also be present
- 14: Leaf axils with paired spines 5–10 mm long. ....23. \**A. spinosus*
- 14: Leaf axils without spines
  - 15: Inflorescence pendulous, deep red to maroon or sometimes greenish .....3. \**A. caudatus*
  - 15: Inflorescence erect, various colours other than deep red to maroon (green but often tinged reddish in *A. cruentus*)
  - 16: Fruit an indehiscent utricle
    - 17: Tepals 5 in female flowers, or if 4, then bracts and bracteoles 1 mm long or longer
      - 18: Fruit ellipsoid, smooth to rugose, longitudinally ribbed; tepals becoming hardened in fruit, with midnerve broad, 0.5–1 mm wide
        - 19: Leaves linear to narrowly oblong or narrowly ovate; margins of tepals at the fruiting stage with a single entire or serrated tooth-like projection on each side .....14. *A. induratus*
        - 19: Leaves ovate or elliptic; margins of tepals of female flowers in fruit without tooth-like projections.....4. *A. centralis*
      - 18: Fruit globose or obovoid, rugulose to rugose, not or weakly ribbed; tepals remaining membranous in fruit, with midnerve narrow, 0.1–0.3 mm wide
        - 20: Leaves ovate to trullate; stems sparsely hairy .....15. *A. interruptus*
        - 20: Leaves linear to narrowly elliptic; stems glabrous.....18. \**A. muricatus*
    - 17: Tepals 3 (rarely 2) in female flowers, or if 4, then bracts and bracteoles less than 1 mm long
      - 21: Plants perennial, prostrate or decumbent, with stems hairy; fruit 2–3 mm long, distinctly longer than tepals ..... 9. \**A. deflexus*
      - 21: Plants annual, erect or prostrate, with stems more or less glabrous; fruit 1–2 mm long, equal to or slightly longer than tepals
        - 22: Young stems glabrous, leaves usually deeply or broadly emarginate; fruit smooth or rugulose in the lower half.....2. \**A. blitum*
        - 22: Young stems sparsely hairy; leaves usually obtuse or shallowly emarginate; fruit rugose all over ..... 26. \**A. viridis*
  - 16: Fruit a circumscissile capsule
    - 23: Bract and bracteoles shorter than or equal to tepals at the fruiting stage
      - 24: Tepals of male and female flowers 3
        - 25: Bracts and bracteoles <2 mm long, acute and mucronate; fruit globose..... 22. *A. rhombus*
        - 25: Bracts and bracteoles 2–3.5 mm long, acuminate and aristate; fruit broadly ovoid or ellipsoid
          - 26: Tepals at the fruiting stage 1.5–2.5 mm long, ovate-oblong to oblong-spathulate, acute, mucronate ..... 10. \**A. dubius*
          - 26: Tepals at the fruiting stage 2.5–4 mm long, narrowly ovate to narrowly elliptic, acuminate, aristate..... 24. \**A. tricolor*
      - 24: Tepals of male and female flowers 4 or 5
        - 27: Leaves narrowly ovate; midnerve of tepals at the fruiting stage broad, 0.5–0.8 mm wide.....5. *A. clementii*
        - 27: Leaves ovate to broadly ovate or rhombic to trullate or elliptic to circular; midnerve of tepals at the fruiting stage narrow, 0.1 mm wide
          - 28: Lamina of mature leaves 5–45 mm long, 4–30 mm wide; tepals at the fruiting stage narrowly obovate to spatulate, often recurved..... 25. *A. undulatus*
          - 28: Lamina of mature leaves 30–120 mm long, 20–80 mm wide; tepals at the fruiting stage ovate-oblong or oblong-spathulate, erect ..... 10. \**A. dubius*
  - 23: Bract and bracteoles longer than tepals at the fruiting stage
    - 29: Young stems and inflorescences sparsely to densely hairy, tepals obtuse or emarginate.....21. \**A. retroflexus*

- 29: Young stems and inflorescences glabrous to sparsely hairy; tepals acute or acuminate
30. Bracts and bracteoles 2–3 mm long, erect
31. Spikes greenish, usually 4–7 mm wide; fruit slightly shorter than or equal to tepals ..... 13. \**A. hybridus*
- 31: Spikes green but often tinged reddish, 7–12 mm wide; fruit equal to or longer than tepals..... 7. \**A. cruentus*
- 30: Bracts and bracteoles 3.5–6 mm long, or if <3.5 mm long then spreading to recurved
32. Tepals of female flowers 5, at the fruiting stage often spreading to recurved or erect, unequal, longest tepal up to 2.5 mm long; fruit c. 1.5 mm long ..... 20. \**A. quitensis*
- 32: Tepals of female flowers 3–5, at the fruiting stage erect, unequal, longest tepal 2.5–4 mm long; fruit 2–2.5 mm long ..... 19. \**A. powellii*

### Conspectus of Australian *Amaranthus* taxa

1. \**Amaranthus albus* L., *Syst. Nat.* 10th edn, 2: 1268 (1759). *Type*: ‘Habitat [in Philadelphae maritimus]’ Herb. C. Linnaeus 1117.1 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* T. Raus in A. Strid & K. Tan (eds), *Fl. Hellenica* 1: 143, 1997).

*Distribution*. Native to North America, naturalised in South America, Eurasia, Africa and Australia. In Australia a weed of the wheatbelt of south-western Western Australia and roadsides and disturbed areas in South Australia, New South Wales, the Australian Capital Territory, Victoria and Tasmania.

2. \**Amaranthus blitum* L., *Sp. Pl.* 2: 990 (1753). *Type*: ‘Habitat in Europa temperatoire’, Herb. C. Linnaeus 1117.14 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* F. Fillias *et al.*, *Taxon* 29: 150, 1980).

*Amaranthus lividus* L., *Sp. Pl.* 2: 990 (1753). *Type*: ‘Habitat in Virginia’, not designated.

*Amaranthus oleraceus* L., *Sp. Pl.* 2nd edn, 2: 1403 (1763); *Amaranthus blitum* var. *oleraceus* (L.) Hook.f., *Flora Brit. India* 4: 721 (1885). *Type*: ‘Habitat in India’, Herb. C. Linnaeus 1117.13 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* F. Fillias *et al.*, *Taxon* 29: 150, 1980).

*Amaranthus ascendens* Loisel., *Not. Fl. France* 141 (1810); *Amaranthus lividus* var. *ascendens* (Loisel.) Hayward & Druce, *Adventive Fl. Tweedside* 177 (1919); *Amaranthus lividus* subsp. *ascendens* (Loisel.) Heukels, *Geill. Schoolfl. voor Nederl.* 11th edn, 169 (1934). *Type*: J.J. Bauhin, *Hist. Pl.* 2: 966, fig. ‘Blitum pulchrum rectum magnum rubrum’ (1651) (*lecto*: *n.v.*, *fide* C.C. Townsend in R.M. Polhill (ed.), *Fl. Trop. E. Africa, Amaranthaceae* 35, 1985).

[*Amaranthus viridis* auct. non L.: J.H. Maiden, *Proc. Linn. Soc. New South Wales* 28: 766 (1904); A.N. Rodd & J. Pickard, *Cunninghamia* 1: 275 (1983).]

*Distribution*. Probably native to Europe, also occurs in Africa, America, Asia and Malaysia. In Australia it is a weed of disturbed sites around Perth in Western Australia, Brisbane and surrounds, islands in the Torres Strait in Queensland, and Sydney in New South Wales. Also recorded from Norfolk and Lord Howe Islands (Green 1994).

3. \**Amaranthus caudatus* L., *Sp. Pl.* 2: 990 (1753). *Type*: 'Habitat in Peru, Persia, Zeylonia', Herb. C. Linnaeus 1117.26 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* C.C. Townsend in E. Nasir & S.I. Ali (eds), *Fl. W. Pakistan* 71: 10, 1974).

*Distribution*. Native to South America, now widespread and commonly cultivated as a garden ornamental. In Australia it is an occasional garden escape in Western Australia, the Northern Territory, South Australia, Queensland, New South Wales and the Australian Capital Territory.

4. *Amaranthus centralis* J.Palmer & Mowatt, *sp. nov.*

Ab *Amarantho indurato* foliis ellipticus vel ovatis, bracteis bracteolisque acuminatis mucronatis, tepalis florum masculorum anguste ovatis acuminatis, et tepalis fructificantibus florum femineorum dentes laterales marginales deficientibus differt. Ab *A. mitchellii* inflorescentiis terminalibus axillaribusque et fructibus majoribus ellipsoideis (1.5–3 mm longis), costis arrectis longitudinalibus plus minusve tuberculatis differt.

*Typus*: Todd River, c. 9.6 km N Alice Springs, Northern Territory, 10 November 1954, G. Chippendale 482 (*holo*: DNA; *iso*: CANB).

*Amaranthus* sp. Todd River (G. Chippendale 482) J. Palmer, in W.R. Barker *et al.* (eds), *Census of South Australian Vascular Plants* 5th ed., *J. Adelaide Bot. Gard. Supplement* 1: 46 (2005).

*Amaranthus* sp. Alice Springs (D.E. Albrecht 8892), in R.A. Kerrigan & D.E. Albrecht (eds), *Checklist of NT vascular Plant Species* p. 14 (2007).

*Amaranthus* sp. Cloncurry (S.T. Blake 8896), in P.D. Bostock & A.E. Holland (eds), *Census Queensland Fl.* 2007 p. 15 (2007).

*Annual herb*, erect, to 60 cm high. *Stems* angular, sometimes reddish, sparsely hairy with glandular or multicellular hairs or becoming glabrous; leaf axils spineless. *Leaves*: petiole 2–20(–35) mm long; lamina elliptic or ovate, 6–35(–55) mm long, 4–17(–25) mm wide, ±undulate, obtuse to emarginate, mucronate, glabrous or sometimes very sparsely hairy on midnerve. *Inflorescences* of axillary globular clusters and sometimes erect terminal spikes to 60 mm long, with male and female flowers. *Bract* 1, persistent, ovate, 1.2–1.8 mm long, shorter than the tepals, acuminate, mucronate. *Bracteoles* 2, persistent, ovate, 1.2–1.8 mm long, shorter than the tepals, acuminate, mucronate. *Tepals* 5; *tepals of male flowers* elliptic to narrowly obovate, 1.5–2 mm long, obtuse to acute, mucronate, margins membranous, whitish, glabrous, midnerve narrow, c. 0.1 mm wide, green; *tepals of female flowers* narrowly obovate-spathulate to obovate-spathulate or spathulate, 2–4 mm long, obtuse, mucronate, erect to recurved, margins membranous, entire, glandular-hairy along some or all of length, midnerve broad, 0.6–1 mm wide, green; *tepals at the fruiting stage* becoming hardened in the lower part and often sigmoid in outline, becoming dark green to brown or straw-coloured, margins remaining entire, falling with fruit. *Stamens* 3, c. 1–1.8 mm long; filaments free; anthers 2-locular, dorsifixed, versatile, dehiscing by extrorse longitudinal slits, 0.5–0.9 mm long. *Ovary* sessile; ovule 1; style c. 0.5 mm long; stigmas 3, erect to recurved, somewhat inflated. *Fruit* an indehiscent utricle, ellipsoid, 1.5–3 mm long, shorter than tepals, slightly rugose, usually ribbed; ribs slightly raised, straight, longitudinal, slightly tuberculate. *Seed* obovoid to broad-obovoid, 1.2–1.4 mm long, smooth, reddish-brown to black, shiny. (Figures 1, 2A)



*Amaranthus centralis* J. Palmer & Mowatt  
 HOLOTYPE  
 Seen for Flora of Australia  
 DET. J. Palmer (CANIS) 14 Apr. 2008

**DNA**

*Amaranthus* ~~intermittens~~ R. Br.  
 HERBARIUM OF NORTHERN TERRITORY  
 ALICE SPRINGS, AUSTRALIA  
 No. 482  
 Name *Amaranthus* ~~intermittens~~  
 Locality *Sold. R., 6 m. N. Alice Springs*  
 Collector *G. Chippendale* Date *10/1/1954*  
 Notes *Herb 1', fleshy. Two galas.*  
*Herb, on minor road.*  
 det. *G. Chippendale* 13 Dec 1956

Figure 1. Holotype of *Amaranthus centralis* (G. Chippendale 482, DNA), scale = 5 cm.



Figure 2. A – tepals at the fruiting stage of *Amaranthus centralis* (G. Chippendale 482), scale = 1 mm; B – tepals at the fruiting stage of *A. induratus* (K.M. Allan 587), arrows indicating single or serrated tooth-like projections on tepal margins, scale = 1 mm.

*Other specimens examined.* WESTERN AUSTRALIA: Marra Mamba, Hamersley Range, 5 July 1966, *J.V. Blockley* 302 *p.p.* (PERTH 200476); 57 km NW of Newman, Fortescue River, 17 July 2001, *P.K. Latz* 18500 (NT *n.v.*, photo at CANB, PERTH *n.v.*, photo at CANB); 8.6 km E of Mt Bruce, 5.2 km S of Mt Oxer, 5.7 km NW of Mt Howieson, Mt Bruce Flats, Hamersley Range, Karijini National Park, 18 May 1992, *S. van Leeuwen* 1214 (PERTH). NORTHERN TERRITORY: Palm Valley, 7 July 1965, *A.C. Beauglehole* 10388 (DNA); Ruby Gorge, Hale River, *c.* 70 miles [*c.* 112 km] ENE of Alice Springs, 14 Oct. 1966, *A.C. Beauglehole* 20749 (DNA); vicinity of Mt Gillen, Alice Springs, 21 Sep. 1955, *N.T. Burbidge & M. Gray* 4238 (CANB); MacDonalld Downs, 25 Oct. 1974, *P.K. Latz* 7871 (DNA); Simpsons Gap, Alice Springs, 27 Feb. 1961, *H.S. McKee* 8644 (CANB, NSW); east side, Alice Springs, 6 May 1964, *D.J. Nelson* 1005 (CANB, DNA); Animal Industry Research Farm, 9.7 km S of Alice Springs, 19 Nov. 1971, *D.J. Nelson* 2168 (CANB, DNA); Parke Creek, E end of Mereenie oil field, 9 Mar. 1983, *A.S. Weston* 13428 (DNA); 8 miles [*c.* 13 km] E Mt Riddock, 2 Oct. 1954, *R.E. Winkworth* 607 (DNA). SOUTH AUSTRALIA: 30 km W of Mimili, Everard Ranges, 17 May 1983, *R. Bates* 2940 (AD); Barrarana Gorge, Flinders Ranges, 23 Apr. 1996, *R. Bates* 42953 (CANB); 'Nilpinna', Nilpinna Hill, W of Lake Eyre, 15 Apr. 1997, *R. Bates* 46903 (CANB); Brachina Creek, Flinders Ranges, 13 July 1998, *R. Bates* 50637 (CANB); near Betty's Well, Everard Park Station, Everard Ranges, Feb. 1965, *D.E. Symon* 3337 (AD, CANB); Ernabella, 1 Apr. 1964, *F.T. Turvey s.n.* (CBG 13742 at CANB). QUEENSLAND: about 87 km W of Betoota, 18 May 1988, *K.P. Nicholson* 209 & *P.E. Novelty* (BRI); Cloncurry, 10 May 1935, *S.T. Blake* 8896 (BRI).

*Distribution and habitat.* Commonly occurs in southern Northern Territory, and from the Everard Ranges near Lake Eyre south to the Flinders Ranges in northern South Australia. There are also two records from the Pilbara region of Western Australia, and two collections from western Queensland.

*Amaranthus centralis* grows in red sand in ephemeral watercourses, sandy to clayey loam on river banks and edges of permanent pools in eucalypt lined channels, or *Acacia* shrubland. It also occurs in areas of permanent watering, e.g. bore overflows, gardens and cultivation. (Figure 3)

*Phenology.* Flowers and fruits throughout the year.

*Etymology.* The epithet reflects the central Australian distribution of this taxon.

*Notes.* *Amaranthus centralis* is most similar to *A. induratus*, but that species has dense or interrupted terminal and axillary inflorescences (axillary globular clusters and sometimes terminal spikes in *A. centralis*), linear to very narrowly oblong or narrowly ovate leaves (elliptic or ovate in *A. centralis*) and the tepals at the fruiting stage are toothed along the margins (entire in *A. centralis*; Figure 2). *Amaranthus centralis* is also similar to *A. mitchellii* and *A. cuspidifolius*, but these species have spatulate to broadly spatulate tepals in female flowers (narrowly obovate-spatulate to obovate-spatulate or spatulate in *A. centralis*) and smaller, rugose utricles that are either unribbed or with prominent undulate ribs (slightly rugose and usually with slightly raised straight ribs in *A. centralis*). Several mixed collections of *A. centralis* and *A. cuspidifolius* from northern South Australia suggest that these two species often grow together.

**5. *Amaranthus clementii*** Domin, *Biblioth. Bot.* 89: 76 (1921). *Type:* between the Ashburton and De Grey Rivers, NW Australia, [Western Australia], purchased Aug. 1900, *E. Clement s.n.* (in Herb. Domin 3793) (*lecto:* PR 526421, here designated, photo at CANB; *isolecto:* K, 2 sheets *n.v.*, photos at CANB).

?*Amaranthus pallidiflorus* var. *viridiflorus* Thell. in R. Probst, *Mitt. Naturf. Ges. Solothurn* 20(8): 60 (1928). *Type:* *n.v.*

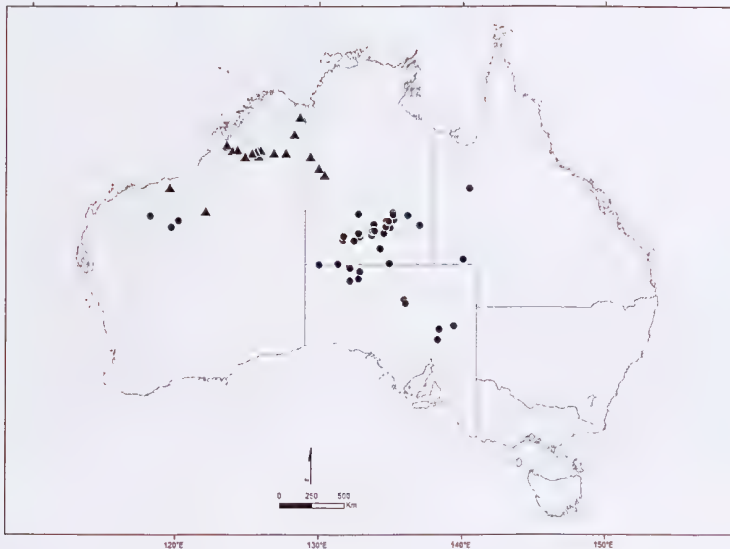


Figure 3. Distribution map for *Amaranthus centralis* (●) and *A. induratus* (▲).



*Distribution.* Endemic to the Pilbara region of Western Australia along the coast including some offshore islands, and inland from Port Hedland south to the Murchison River. Also recorded from Rudall River National Park in the Little Sandy Desert.

*Typification.* The lectotype was originally chosen by A. Kanis while on a visit to PR in May 1976. There are two sheets at PR: 'inter flumina Ashburton and De Grey River, W.A., viii 1900, *E. Clement s.n.* (in Herb. Domin 3791), PR 526419' and 'between the Ashburton and De Grey River, NW Australia, purchased Aug. 1900, *E. Clement s.n.* (in Herb. Domin 3793), PR 526421'. Kanis chose PR 526421 as the type, annotating PR 526419 with 'This material is not fully conform [*sic*] the description as a terminal inflorescence is clearly developed here and some leaves are larger'. Subsequent additional collections of *A. clementii* indicate that this material is indeed representative of the species, which can develop a terminal inflorescence and has variably-sized leaves. Accordingly, this sheet (PR 526419) is here considered part of the original material.

**6. *Amaranthus cochleitepalus*** Domin, *Biblioth. Bot.* 89: 80 (1921). *Type:* Pentland, Queensland, February 1910, *K. Domin s.n.* (*holo:* PR 526427, photo at CANB).

*Amaranthus* sp. B *sensu* J.R. Wheeler (ed.), *Fl. Kimberley Region* 113 (1992).

*Amaranthus* sp. B Kimberley Flora (R.D. Royce 3324), Western Australian Herbarium, in *FloraBase*, <http://florabase.dec.wa.gov.au> [accessed 17 October 2007].

*Distribution.* Occurs near Port Hedland in the Pilbara region (also known from one locality in the Kimberley region) of Western Australia, on the Barkly Tableland and south towards Alice Springs in the Northern Territory, and Camooweal, south of the Gulf of Carpentaria and near Clermont in Queensland.

*Notes.* Specimens apparently intermediate between *Amaranthus cochleitepalus*, *A. cuspidifolius* and *A. mitchellii* have been seen. See notes under *A. mitchellii* for further details.

**7. \* *Amaranthus cruentus*** L., *Syst. Nat.* 10th edn, 2: 1269 (1759); *Amaranthus paniculatus* var. *cruentus* (L.) Moq. in A.L.P.P. de Candolle, *Prodr.* 13(2): 257 (1849); *Amaranthus hybridus* subsp. *cruentus* (L.) Thell., *Fl. Adv. Montpellier* 205 (1912); *A. hybridus* var. *cruentus* Mansf. *Die Kultureflanzen* 2: 54 (1959). *Type:* 'Habitat in China', Herb. C. Linnaeus 1117.25 (*lecto:* LINN *n.v.* [IDC microfiche seen], *fide* C.C. Townsend in E. Nasir & S.I. Ali (eds), *Fl. W. Pakistan* 71: 12, 1974).

*Amaranthus paniculatus* L., *Sp. Pl.* 2nd edn, 2: 1406 (1763). *Type:* 'Habitat in America', Herb. C. Linnaeus 1117.20 (*lecto:* LINN *n.v.* [IDC microfiche seen], *fide* M.N. El Hadidi & A.M.H. El Hadidy, *Taeckholmia, Addit. Ser.* 1: 37, 1981).

*Distribution.* Probably originated as a grain crop in southern Mexico or Guatemala but widely grown as a dye plant, ornamental and pot-herb in Central America, Europe, China, India, south-east Asia, and Africa. In Australia recorded as an uncommon weed mainly occurring spontaneously in gardens and disturbed areas around Perth in Western Australia, and in South Australia, New South Wales and Victoria.

**8. *Amaranthus cuspidifolius*** Domin, *Biblioth. Bot.* 89: 78 (1921). *Type*: between the Ashburton and De Grey Rivers, NW Australia, [Western Australia], purchased Aug. 1900, *E. Clement s.n.* (*holo*: PR 526426, photo at CANB).

*Distribution.* Occurs in the Pilbara region of Western Australia, east into the Sandy and Gibson Deserts and ranges of the southern Northern Territory, in northern South Australia south to Oodnadatta and the Flinders Ranges, on Nappa Merri Station in south-western Queensland, and near Broken Hill and Louth in western New South Wales.

*Notes.* Specimens apparently intermediate between *Amaranthus cuspidifolius*, *A. mitchellii* and *A. ochleitopalus* have been seen. See *Notes* under *A. mitchellii* for further details.

**9. \**Amaranthus deflexus*** L., *Mant. Pl. Altera* 295 (1771). *Type*: Cultivated specimen from Uppsala Botanic Garden, Herb. C. Linnaeus 1117.18 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* P. Aellen in K.H. Rechinger (ed.), *Fl. Iranica* 91: 7, 1972).

*Distribution.* Native to South America and now naturalised in North America, the Mediterranean and Australia. In Australia it is an occasional weed of disturbed ground in South Australia, New South Wales, Victoria and Tasmania.

**10. \**Amaranthus dubius*** Mart. ex Thell., *Fl. Adv. Montpellier* 203 (1912). *Type*: cultivated material from Erlangen Botanic Garden, ex Herb. Schwaeigrichen (*neo*: M *n.v.*, *fide* C.C. Townsend, *Kew Bull.* 29(3): 471–472, 1974).

*Distribution.* An annual weed with a pantropical distribution, *A. dubius* is commonly grown as a leafy vegetable in south-east Asia (Grubben 1993), and is also widely cultivated and naturalised in Papua New Guinea, Timor and Indonesia, with a single record from Christmas Island (Barker 1993). Grown as a vegetable on Horn and Thursday Islands in the Torres Strait, and also available from vegetable markets in northern Australia (B.M. Waterhouse, pers. comm. 1999). Not known to be established in Australia, but recorded from Nhulunbuy, Northern Territory (*A.A. Mitchell* 5601, CANB) as an infrequent inhabitant at the local rubbish tip and from Cooktown, Queensland (*Hornby s.n.*, CANB 739005) as a single plant 'grown from mulch obtained from banks of Endeavour River'.

**11. \**Amaranthus graecizans*** L., *Sp. Pl.* 2: 990 (1753). *Amaranthus angustifolius* Lam., *Encycl. Meth.* 1: 115 (1783), *nom. illeg.* *Type*: 'Habitat in Virginia', Clayton 442 (*lecto*: BM 000051563 *n.v.*, *fide* M.L. Fernald, *Rhodora* 47: 139, pl. 887, 1945).

**11a. \**Amaranthus graecizans*** subsp. *silvestris* (Vill.) Brenan, *Watsonia* 4: 273 (1961), as *silvestris*; *Amaranthus silvestris* Vill., *Cat. Pl. Jard. Strasbourg* 111 (1807); *Amaranthus graecizans* var. *silvestris* (Vill.) Asch., *Beitrag zur Flora Aethiopiens* 1: 176 (1867), as *silvester*; *Amaranthus angustifolius* var. *silvestris* (Vill.) Thell. in H. Schinz & R. Keller, *Fl. Schweiz* 4th edn, 1: 222 (1923), as *Amarantus*; *Amaranthus angustifolius* subsp. *silvestris* (Vill.) Heukels, *Geill. Schoolfl. voor Nederl.* (1934). *Type*: Herb. Tournefort 1849 (*lecto*: P *n.v.* [IDC microfiche 90.19], *fide* C.C. Townsend in R.M. Polhill (ed.), *Fl. Trop. E. Africa, Amaranthaceae* 31, 1985).

*Distribution.* Native to southern Europe, northern Africa and western Asia, although now widely naturalised. In Australia it is naturalised around Adelaide in South Australia, near Biloela in Queensland and at Inglewood and Casterton in Victoria.

**12. *Amaranthus grandiflorus*** (J.M. Black) J.M. Black, *Trans. & Proc. Roy. Soc. South Australia* 60: 166 (1936); *Amaranthus mitchellii* var. *grandiflorus* J.M. Black, *Trans. & Proc. Roy. Soc. South Australia* 47: 368 (1923). *Type*: Depot Creek, 10 June 1883, Herb. R. Tate *s.n.* (*holo*: AD 99436234).

*Distribution*. Occurs from the southern Northern Territory into the Lake Eyre region and scattered sites southwards in South Australia, south-western Queensland, western New South Wales and in the Hattah Lakes area in north-western Victoria.

**13. \**Amaranthus hybridus*** L., *Sp. Pl.* 2: 990 (1753). *Type*: 'Habitat in Virginia', Herb. C. Linnaeus 1117.19 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* C.C. Townsend in E. Nasir & S.I. Ali (eds), *Fl. W. Pakistan* 71: 19, 1974).

*Amaranthus chlorostachys* Willd., *Hist. Amaranth.* 34, t. X, fig. 19 (1790). *Type*: illustration in C.L. Willdenow, *Hist. Amaranth.* 34, t. X, fig. 19 (1790).

*Amaranthus patulus* Bertol., *Comm. Neap.* 19, t. 2 (1837). *Type*: Italy, Naples, 1834, Bertoloni *s.n.* (*holo*: BOLO *n.v.*, *fide* C.C. Townsend in R.M. Polhill (ed.), *Fl. Trop. E. Africa, Amaranthaceae* 25, 1985).

*Distribution*. Native of North America, now widespread as a weed in the temperate regions of the world. In Australia it is a weed of cultivation and disturbed areas in south-western Western Australia, the Northern Territory, South Australia, Queensland, New South Wales, the Australian Capital Territory and Victoria. Also occurs on Christmas Island (Barker 1993).

**14. *Amaranthus induratus*** C.A. Gardner ex J. Palmer & Mowatt, *sp. nov.*

Ab *Amarantho centrali* foliis anguste oblongis vel anguste ovatis bracteis bracteolisque acutis, tepalis florum masculorum anguste ellipticus vel obovatis obtusis, et praesentia dentium lateralium in marginibus tepalorum fructificantium differt. Ab *A. undulato* et *A. clementii* fructibus costatis ellipsoideis indehiscentibus differt.

*Typus*: 43 miles [c. 69 km] S of Derby at river crossing, Western Australia, 25 January 1971, K.M. Allan 587 (*holo*: PERTH 00205869; *iso*: CANB).

*Amaranthus* sp. A. *sensu* J.R. Wheeler (ed.), *Fl. Kimberley Region* p. 111, fig. 27J (1992).

*Amaranthus* sp. A. Kimberley Flora (C.A. Gardner *s.n.* PERTH 00326518), Western Australian Herbarium, in *FloraBase*, <http://florabase.dec.wa.gov.au> [accessed 17 October 2007].

*Amaranthus* sp. Birrindudu (J.L. Egan 4244), in R.A. Kerrigan. & D.E. Albrecht (eds), *Checklist of NT Vascular Plant Species* p. 4 (2005).

*Annual herb*, erect, up to 90 cm high. *Stems* rounded, sparsely hairy with glandular or multicellular hairs or becoming glabrous, leaf axils spineless. *Leaves*: petiole to 25 mm long; lamina linear to very narrowly oblong or narrowly ovate, 15–70 mm long, 2–10 mm wide, obtuse to emarginate, mucronate. *Inflorescences* of axillary globose clusters and axillary and terminal erect, dense or interrupted spikes to 23 cm long, sometimes forming panicles, predominantly female-flowered. *Bract* 1, persistent, ovate,

*c.* 1 mm long, shorter than the tepals, acute. *Bracteoles* 2, persistent, ovate, *c.* 1 mm long, shorter than the tepals, acute. *Tepals* 5; *tepals of male flowers* narrowly elliptic to obovate, *c.* 1.5 mm long, obtuse, margins membranous, whitish, glabrous, midnerve narrow, 0.1 mm wide, green; *tepals of female flowers* obovate-spathulate, 1.5–2.4 mm long, obtuse, ±mucronulate, erect or recurved, margins entire, membranous, whitish, glabrous or with sparse glandular hairs along the margins in the lower half, midnerve broad, 0.5–1 mm wide, green; *tepals at the fruiting stage* becoming elongated, 2.4–3.5 mm long, obovate-spathulate or narrowly obovate-spathulate, hardened, green to straw-coloured, margins developing a single entire or serrated tooth-like projection on each side below the middle, falling with fruit. *Stamens* 3, 0.8–1.2 mm long; filaments free; anthers 2-locular, dorsifixed, versatile, dehiscing by extrorse longitudinal slits, 0.6–0.9 mm long. *Ovary* sessile; ovule 1; style and stigmas up to 1 mm long, often inflated; stigmas 3, erect to recurved. *Fruit* an indehiscent utricle, ellipsoid, 1.5–3 mm long, slightly shorter than tepals, smooth to rugulose, ribbed; ribs slightly raised, straight, longitudinal, tuberculate. *Seed* obovoid, 1.3–1.5 mm long, smooth, reddish-black, shiny. (Figures 2B, 4)

*Other specimens examined.* WESTERN AUSTRALIA: near Warralong Homestead, May 1941, *N.T. Burbidge* 726 (PERTH); Halls Creek township, 12 July 1974, *G.W. Carr* 3512 & *A.C. Beaglehole* 47290 (AD, CANB, MEL); Geikie Gorge National Park, 17 July 1974, *G.W. Carr* 3812 & *A.C. Beaglehole* 47590 (AD, CANB, MEL); Hill near Fitzroy Crossing, Apr. 1927, *A.J. Ewart s.n.* (PERTH 00201693); Gogo, Fitzroy River, Apr. 1951, *C.A. Gardner s.n.* (PERTH 00326518); Carlton Reach Experimental Plots, Ord River, 29 May 1944, *C.A. Gardner* 7306 (PERTH); bank of Fitzroy River at Fitzroy Crossing, 28 May 1967, *E.N.S. Jackson* 993 (AD, DNA); Rudall River Region, Sep. 1986, *W.G. Martinick & Associates* 135 (PERTH 1218581); Old Wyndham Road, 5.63 km from Kununurra on a bearing of 77°, 28 Apr. 1999, *A.A. Mitchell* 5749 (CANB); Margaret River Downs, Apr. 1944, *Captain Montgomery s.n.* (MEL 59695, PERTH 00265950); 203 miles [325 km] E of Derby on Halls Creek road, 28 Apr. 1967, *Y. Power* 408 (PERTH); Mt Anderson Stn, Fitzroy River, 7 May 1962, *R.D. Royce* 6904 (CANB, PERTH); Camballan [Camballin], Fitzroy River, 8 May 1962, *R.D. Royce* 6929 (PERTH); Bow River Station turn-off, 15 miles [24 km] N of Turkey Creek, 20 June 1967, *D.E. Symon* 5267 (AD); 32 miles [51 km] SW of Mary River crossing, 22 June 1967, *D.E. Symon* 5287 (AD, CANB, PERTH); 43 miles [68 km] E of Fitzroy Crossing, 22 June 1967, *D.E. Symon* 5297 (AD, PERTH 00239968); 29 km W of Fitzroy Crossing, 21 May 1971, *D.E. Symon* 6985 (CANB, PERTH). NORTHERN TERRITORY: Birrindudu Stn, 19 June 1994, *J.E. Egan* 4244 (DNA *n.v.*, photo at CANB); west of Spyder Lake, 29 Apr. 2004, *D.L. Lewis* 14 & *D.J. Dixon* (DNA *n.v.*, photo at CANB); 11 km NE of Wilson Ck bore, *c.* 90 km NE of Tanami, 17 May 1971, *D.E. Symon* 6918 (DNA).

*Distribution and habitat.* Occurs in Western Australia, along the Ord and Fitzroy Rivers in the Kimberley region, south-west into the Rudall River area and Warralong Homestead in the Pilbara region. Also recorded from the Tanami Desert area of the Northern Territory. (Figure 3) Grows in red clay or loam along watercourses or near clay pans, with *Acacia* and *Bauhinia* spp. It has also been recorded from cultivated areas in the vicinity of the Ord River, Western Australia.

*Phenology.* Flowers mainly April to July but has also been recorded as flowering in January, February and September.

*Etymology.* A manuscript name coined by C.A. Gardner most likely referring to the tepals which become hardened or indurated in fruit.



Figure 4. Holotype of *Amaranthus induratus* (K.M. Allan 587, PERTH), scale = 5 cm.

*Notes.* *Amaranthus induratus* is probably most closely related to *A. centralis*, but that species has elliptic or ovate leaves (linear to very narrowly oblong or narrowly ovate in *A. induratus*) and the tepals at the fruiting stage lack tooth-like projections (toothed in *A. induratus*; Figure 2). *Amaranthus induratus* is also similar to *A. mitchellii* but that species differs in having inflorescences of mostly axillary clusters (axillary globose clusters and dense or interrupted terminal spikes in *A. induratus*), shorter, ovate or narrowly ovate to oblong leaves (longer, linear to very narrowly oblong or narrowly ovate in *A. induratus*), tepals at the fruiting stage that lack teeth (tepal margins toothed in *A. induratus*) and obovoid to globose fruit that are rugose with inflated undulate ribs (ellipsoid fruit that are smooth to rugose with slightly raised, straight, longitudinal, tuberculate ribs in *A. induratus*).

One specimen (*Martinick & Associates* 135, PERTH 01218581) from the Rudall River region, Western Australia, differs slightly in that the tepals at the fruiting stage have entire margins or sometimes extremely reduced tooth-like projections, but in all other respects the material matches *A. induratus*.

**15. *Amaranthus interruptus*** R.Br., *Prodr.* 414 (1810); *Euxolus interruptus* (R.Br.) Moq. in A.L.P.P. de Candolle, *Prodr.* 13(2): 267, 275 (1849). *Type:* tropical areas of Northern Territory and Queensland, 'North Coast', *R. Brown, Iter Australiense 3048* (*holo:* BM 000847081 *n.v.*, photo at CANB; *iso:* K 000356720 *n.v.*, photo at CANB).

*Amaranthus lineatus* R.Br., *Prodr.* 414 (1810); *Euxolus lineatus* (R. Br.) Moq. in A.L.P.P. de Candolle, *Prodr.* 13(2): 267, 276 (1849). *Type:* tropical areas of Northern Territory and Queensland, 'North Coast', *R. Brown, Iter Australiense 3049* (*holo:* BM 000884578 *n.v.*, photo at CANB; *iso:* K 000356721 *n.v.*, photo at CANB).

[*Amaranthus crispus auct. non* (Lesp. & Thévenau) A. Braun ex J.M. Coult. & S. Watson, Western Australian Herbarium, in *FloraBase*, <http://florabase.dec.wa.gov.au> [accessed 17 October 2008]].

*Distribution.* Recorded from Kununurra, the Ord River and Bungle Bungle National Park in the Kimberley region of Western Australia. Common on the Barkly Tableland and to the south in the Northern Territory, eastwards into Queensland and then scattered further south into the Musgrave Ranges and northern Flinders Ranges, South Australia. Also occurs on the coral cays of Ashmore Reef in Western Australia, where it was previously erroneously identified as *Amaranthus crispus* (Lesp. & Theven.) Terracc., and on Raine Island off the east coast of Queensland. Backer (1949) records it from Timor and New Guinea; this material may represent introductions (Kanis 1978).

**16. *Amaranthus macrocarpus*** Benth., *Fl. Austral.* 5: 216 (1870), as *Amarantus*; *Euxolus macrocarpus* (Benth.) F. Muell., *Native Pl. Victoria* 1: 161 (1879). *Type:* junction of the Murray & Darling, New South Wales, Dec. 1853, *F. Mueller s.n.* (*lecto:* MEL 59717 here designated; *isolecto:* MEL 59716, K p.p. (left-hand side specimens) *n.v.*, photo at CANB, NSW 16811).

*Typification.* Bentham (1870) cites several collections in the protologue, from Queensland: Armadilla, *W. Barton* 14 (MEL 59715); Dawson River, *Leichhardt* 304 (MEL 59714); and New South Wales: junction of the Murray & Darling, *F. Mueller s.n.* (MEL 59717, MEL 59716, K p.p., NSW 16811); Darling River, ?*Woolls s.n.* (MEL 59718) [*Woolls* is not listed on the label, but the corner has been initialled with a 'B' indicating that Bentham has seen it]. Mueller's collection at MEL (MEL 59717) has been chosen as the lectotype as this gathering is the most widely distributed. The right-hand specimen of the K collection, collected by *F.C. Dalton*, is an isotype of *A. macrocarpus* var. *pallidus* Benth.

**16a. *Amaranthus macrocarpus* Benth. var. *macrocarpus*.** *Amaranthus macrocarpus* Benth. var. *melanocarpus* Thell. in P.F.A. Ascherson & K.R.O.P.P. Graebner, *Synopsis der Mitteleuropaischen Flora* 5(1): 311 (1914), *nom. inval.*

*Distribution.* Occurs from near Emerald in central Queensland south into northern Victoria, and scattered localities in the southern and eastern Northern Territory and eastern South Australia. Also recorded as a weed at Flemington Saleyards in Sydney and Tamworth Agricultural Research Centre in New South Wales, and in several Victorian towns along the Murray River.

**16b. *Amaranthus macrocarpus* var. *pallidus* Benth., *Fl. Austral.* 5: 216 (1870).** *Type:* Curriwillighie [Currawillinghi], Queensland, *s. dat.*, *F.C. Dalton s.n.* (*holo:* MEL 59713; *iso:* K *p.p.* (right-hand side specimen) *n.v.*, photo at CANB).

*Distribution.* Occurs near Macalister and Noondoo in southern Queensland, around Brewarrina, Walgett and Inverell in northern NSW, and in south-eastern South Australia.

**17. *Amaranthus mitchellii* Benth., *Fl. Austral.* 5: 214 (1870), as *Amarantus*; *Euxolus mitchellii* (Benth.) F. Muell. in E. Giles, *Geog. Cent. Aust.* 214 (1875), as *Mitchelli*; *Amaranthus mitchellii* var. *typicus* Domin, *Biblioth. Bot.* 89: 78 (1921), *nom. inval.* *Type:* Narran River, [probably New South Wales], 24 Mar. 1846, *T.L. Mitchell s.n.* (*lecto:* K 000356723 *n.v.*, here designated, photo at CANB; *isolecto:* BM 000894979 *p.p.* (top right-hand specimen), photo at CANB, MEL 59723).**

*Amaranthus mitchellii* var. *strictifolius* Domin, *Biblioth. Bot.* 89: 78 (1921). *Type:* at the foot of Mt Walker, Queensland, Feb. 1910, *K. Domin s.n.* (*holo:* PR 526423, photo at CANB).

[*Amaranthus undulatus* *auct. non* R.Br.: J. Lindley in T.L. Mitchell, *J. Exped. Trop. Austr.* 102 (1848).]

*Distribution.* Commonly occurs on the Barkly Tableland, Northern Territory, south into the Lake Eyre region of northern South Australia, central Queensland and northern New South Wales. It has also been recorded from Roy Hill and Kununurra in the Pilbara and Kimberley regions of Western Australia, the latter possibly as an introduction, and once as an introduction in Sydney, New South Wales.

*Typification.* Several collections are cited by Bentham (1870) in the original protologue, from Queensland: Flinders River, *Sutherland s.n.* (MEL 59729); Charleville, *Giles s.n.* (MEL 59721); Armadilla, *W. Barton* 36 (MEL 59724); and New South Wales: Narren River, *T.L. Mitchell s.n.* (BM 000894979, K 000356723); between the Darling and Cooper's Creek, *Neilson s.n.* (MEL 59722); Ballandool River, *Locker s.n.* (MEL 59728). The K sheet of the Mitchell gathering has been chosen as the lectotype as it is the most complete and representative specimen, and is the only sheet annotated by Bentham with reference to *A. undulatus*. Isolectotype material at BM comprises two taxa, one plant of *Amaranthus mitchellii* at the top right and two stems of *Chenopodium* sp. on the lower part of the sheet. Bentham cites Mitchell's collection as occurring in Queensland but according to the coordinates cited by Mitchell (1848: 103), 'Lat. 29° 6' 33 ' S', the specimens were more than likely collected south of the border in New South Wales.

*Notes.* Several collections (e.g. *R.J. Bates* 47269 (CANB), *W.R. Barker* 285 (AD, CANB), *N.N. Donner* 9834 (AD, CANB)) from northern and north-eastern South Australia represent plants apparently

intermediate between *Amaranthus mitchellii*, *A. cuspidifolius* and *A. cochleitepalus*. These plants have inflorescences of dense sessile clusters of flowers in the leaf axils as in *A. cochleitepalus*, broadly spatulate, reflexed tepals similar to *A. cuspidifolius* and *A. mitchellii*, and narrowly ovate to ovate, obtuse to emarginate leaves as in *A. mitchellii*. Further research is required to ascertain the status of these plants and whether they warrant recognition as a distinct taxon.

**18. \*Amaranthus muricatus** (Moq.) Hieron., *Bol. Acad. Nac. Ci.* 4: 421 (1882); *Euxolus muricatus* Moq. in A.L.P.P. de Candolle, *Prodr.* 13(2): 276 (1849). *Type*: prope Mendoza, *Gillies s.n.* (*syn*: K *n.v.*); Buenos-Ayres, *Tweedie s.n.* (*syn*: *n.v.*).

*Distribution.* Native to South America, now naturalised in Africa, Europe and Australia. In Australia it is a weed of disturbed ground in southern South Australia, New South Wales and Victoria.

**19. \*Amaranthus powellii** S.Watson, *Proc. Amer. Acad.* 10: 347 (1875). *Type*: United States, grown at Harvard University, 1874, seed obtained from Arizona Indians by Powell *s.n.*, US 16163 (*holo*: US 16163 *n.v.*; *iso*: MO *n.v.*, *fide* J.D. Sauer, *Ann. Missouri Bot. Gard.* 54(2): 108, 1967).

[*Amaranthus hybridus auct. non L.*: W.M. Curtis, *Student's Fl. Tas.* 3: 566 (1967).]

[*Amaranthus hybridus auct. non L. subsp. hybridus*: W.M. Curtis, *Student's Fl. Tas.* 3: 566 (1967).]

[*Amaranthus hybridus subsp. incurvatus auct. non* (Timeroy ex Gren. & Godr.) Brenan: W.M. Curtis, *Student's Fl. Tas.* 3: 566 (1967).]

[*Amaranthus retroflexus auct. non L.*: W.M. Curtis, *Student's Fl. Tas.* 3: 566 (1967).]

*Distribution.* Native to western North and South America; since 1900 its distribution has expanded to include the eastern USA, Europe, India, southern Africa and Australia. A weed of disturbed sites in all Australian states and territories except the Northern Territory.

**20. \*Amaranthus quitensis** Kunth, *Nov. Gen. Sp.* (quarto ed.) 2: 194 (1817). *Type*: 'Crescit in ripa fluvii Guallabambae, (Regno Quitensi)' [Ecuador], *Humboldt & Bonpland* 3082 (*holo*: P *n.v.*, *fide* M. Costea *et al.*, *Sida* 19(4): 956, 2001).

*Distribution.* Native to riverbanks in South America and a weed throughout most of that continent, semi-cultivated as a food dye. In Australia an uncommon weed in New South Wales from Muswellbrook to Sydney.

**21. \*Amaranthus retroflexus** L., *Sp. Pl.* 2: 991 (1753). *Type*: 'Habitat in Pennsylvania [Pennsylvania]. Kalm' – cultivated material from Uppsala Botanic Garden, Herb. C. Linnaeus 1117.22 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* C.C. Townsend in E. Nasir & S.I. Ali (eds), *Fl. W. Pakistan* 71: 13, 1974).

*Distribution.* Native to North America, now a widespread weed in temperate areas of the world. In Australia it is a weed of disturbed ground near Esperance, Western Australia, Alice Springs in the Northern Territory, in South Australia, Queensland, New South Wales, the Australian Capital Territory and Victoria.



**22. *Amaranthus rhombus*** R.Br., *Prodr.* 414 (1810); *Euxolus rhombus* (R.Br.) Moq. in A.L.P.P. de Candolle, *Prodr.* 13(2): 268, 272 (1849). *Type*: tropical areas of Northern Territory and Queensland, 'North Coast', R. Brown, *Iter Australiense* 3050 (*holo*: BM 000522509, photo at CANB; *iso*: K 000356722 *n.v.*, photo at CANB).

*Distribution*. Mostly found along the northern coast of the Northern Territory, on the Cobourg and Gove Peninsulas, Groote Eylandt and nearby islands. It also occurs in north-east Queensland in the vicinities of Chillagoe and Mungana.

**23. \**Amaranthus spinosus*** L., *Sp. Pl.* 2: 991 (1753). *Type*: 'Habitat in India', Herb. C. Linnaeus 1117.27 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* W. Fawcett & A.B. Rendle, *Fl. Jamaica* 3: 130, 1914).

*Distribution*. Native of tropical America. In Australia it is a weed of poor soils in higher rainfall areas such as the Gove Peninsula, Northern Territory, east coast of Queensland, northern New South Wales, and with one record from Tasmania. It is also recorded from Christmas Island (Barker 1993).

**24. \**Amaranthus tricolor*** L., *Sp. Pl.* 2: 989 (1753). *Type*: 'Habitat in India', Herb. C. Linnaeus 1117.7 (*lecto*: LINN *n.v.* [IDC microfiche seen], *fide* C.C. Townsend in E. Nasir & S.I. Ali (eds), *Fl. W. Pakistan* 71: 14, 1974).

*Amaranthus melancholicus* L., *Sp. Pl.* 2: 989 (1753). *Type*: 'Habitat in India', Herb. C. Linnaeus 1117.4 (*lecto*: LINN *n.v.*, *fide* C.C. Townsend in J.M. Bosser *et al.* (eds), *Fl. Mascareignes* 142: 11, 1994).

*Distribution*. A popular ornamental and edible plant in the tropics with a widespread distribution, possibly originating in Asia. In Australia it is recorded from the Ord River area, Western Australia, on Mallapunyah and Wollongorang Stations in the Gulf of Carpentaria, Northern Territory and doubtfully naturalised in the Darling Downs region of southern Queensland (Bostock & Holland 2007). Also occurs on Christmas Island (Barker 1993).

**25. *Amaranthus undulatus*** R.Br., *Prodr.* 414 (1810); *Euxolus undulatus* (R.Br.) Moq. in A.L.P.P. de Candolle, *Prodr.* 13(2): 268, 272 (1849). *Type*: Arnhem N Bay [Melville Bay, Northern Territory], R. Brown, *Iter Australiense* 3047 (*holo*: BM 000522508 *p.p.* (right hand side), photo at CANB, *iso*: K *n.v.*, *fide* A. Kanis *in adnot.* and D. Foreman, ABLO, *pers. comm.* (1997).

*Amaranthus pallidiflorus* F.Muell., *Fragm.* 1(5): 140 (1859), as *Amarantus*. *Type*: on the dry banks of watercourses between the Victoria and Fitzmaurice Rivers, Arnhem Land, Oct. 1855, F. Mueller *s.n.* (*holo*: MEL 39733).

*Amaranthus leptostachyus* Benth., *Fl. Austral.* 5: 214 (1870), as *Amarantus*. *Type*: 'Two Isles' off Cape Flattery, [Queensland], 31 July 1848, J. MacGillivray *s.n.*; (*lecto*: K, here designated, photo at CANB; *isolecto*: K, photo at CANB).

[*Amaranthus grandiflorus auct. non* (J.M.Black) J.M.Black, in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 136 (2000).

*Distribution.* Occurs throughout the Pilbara and Kimberley regions (including offshore islands) of Western Australia, around Victoria River and the Gulf of Carpentaria in the Northern Territory, near Mt Isa and Mt Mulligan in Queensland and on offshore islands and cays in the Torres Strait and off the east coast of Queensland. Recorded (as *A. leptostachyus*) from New Guinea (Backer 1949) but this may be an introduction (Kanis 1978).

*Typification.* Of the available original material of *Amaranthus leptostachyus*: Port Darwin, North Australia [Northern Territory], Oct. 1849, *Schultz s.n.* (K, photos at CANB, MEL 59759; ?AD 98147273); 'Two Isles' off Cape Flattery, [Queensland], 31 July 1848, *J. MacGillivray s.n.*; (K, photo at CANB), the MacGillivray collection has been chosen as the lectotype, as it is the most complete and representative specimen.

**26. \**Amaranthus viridis* L.,** *Sp. Pl.* 2nd edn, 2: 1405 (1763); *Amaranthus gracilis* Desf., *Tabl. École Bot.* 43 (1804); *Euxolus viridis* (L.) Moq. in A.L.P.P. de Candolle, *Prodr.* 13(2): 273 (1849). *Type:* 'Habitat in Europa, Brasilia', Herb. C. Linnaeus 1117.15 (*lecto:* LINN *n.v.* [IDC microfiche seen], *vide* W. Fawcett & A.B. Rendle, *Fl. Jamaica* 3: 131, 1914).

*Distribution.* Probably native to Europe but now a cosmopolitan weed. In Australia it is naturalised in all mainland states and territories, including some of the Barrier Reef and Torres Strait Islands off the Queensland coast. It is also recorded from Christmas Island and the Coral Sea Islands (Barker 1993).

#### Excluded names

***Amaranthus enervis* (F. Muell.) Benth.,** *Fl. Austral.* 5: 216 (1870), as *Amarantus*

= *Scleroblitum atriplicinum* (F. Muell.) Ulbr. (Chenopodiaceae), *vide* P.G. Wilson, *Fl. Australia* 4: 175 (1984)

***Amaranthus tenuis* Benth.,** *Fl. Austral.* 5: 216 (1870), as *Amarantus*

= *Scleroblitum atriplicinum* (F. Muell.) Ulbr. (Chenopodiaceae), *vide* P.G. Wilson, *Fl. Australia* 4: 175 (1984)

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## Index to taxa

Names in bold *italics* are accepted in this treatment. Names in italics are considered to be synonyms or are marked as 'Excl.' for excluded names. Taxon numbers are those used in the text.

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